ACTA SCIENTIARUM POLONORUM Acta Sci. Pol., Administratio Locorum 25(1) 2026, 107–130.
https://czasopisma.uwm.edu.pl/index.php/aspal plISSN 1644-0749 eISSN 2450-0771 DOI: 10.31648/aspal.11025

ORIGINAL PAPER
Received: 14.01.2025 Accepted: 25.10.2025

AI IN THE DEVELOPMENT OF DIGITAL GIANTS MAAMA AND GLOBAL CHANGES

Jacek Kwiatkowski[1]✉, Łukasz Kryśkiewicz[2]✉

[1] ORCID: 0000-0001-8221-2194
[2] ORCID: 0000-0003-1362-7657
[1] Warsaw University of Life Sciences
Nowoursynowska Street, 166, 02-787 Warsaw, **Poland**
[2] Warsaw School of Economics
Niepodległości Avenue, 162, 02-554 Warsaw, **Poland**

ABSTRACT

Motives: In the following article, the authors address the dynamic growth of the large digital giants. It is important to remember that the modern corporate landscape is changing rapidly. New superpowers corporations such as Nvidia (producing semiconductors necessary for the development of technologies based on artificial intelligence) and Open AI (creator of the revolutionary Chat GPT) have emerged. Some commentators and analysts also add Microsoft and Netflix to the list of the largest or most influential corporations. And so, instead of the recent acronym GAFA (Google, Amazon, Facebook, Apple), we now have another acronym, MAAMA (Microsoft, Alphabet [erlier Google], Amazon, Meta [erlier Facebook], Apple). These transformations in recent years have been accompanied by the rapid development of artificial intelligence. The growing role of AI is embedded in the development of contemporary information flows. Streaming is also a sign of the times, so Netflix can be considered one of the leading players in the global technology market (and, as we know, the platform run by Amazon – Amazon Prime Video, for example, also operates in the streaming services sector). The authors' attention is focused on the question of the combination of MAAMA's monopoly position and their access to metadata, used for rapidly developing machine learning techniques. This phenomenon is accompanied by significant social changes. In part, they are reflected in the worsening demographic problems of recent years.
Aim: The main purpose of the research is to show the rapidly changing spectrum of functioning in global markets, digital giants MAAMA. Another aim of the paper is to present the potential risks and dangers of MAAMA's solidifying monopolistic position in the world.
Results: The novelty of this paper lies in the analysis of two-speed processes in a changing geopolitical and global dimension – namely, the growing data processing capabilities in the digital world and the projected economic slowdown in the real world and traditional economic sectors in the coming years.

Keywords: MAAMA-Group, socio-cultural changes, artificial intelligence, machine learning

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

© Copyright by Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie

INTRODUCTION

The primary aim of this article is a multifaceted analysis of the functioning of the 5 market leaders in the MAAMA digital services market (Microsoft, Alphabet, Amazon, Meta, Apple) and the considerations arising from the global environment in which they operate.

The complementary aim of the research is to determine the impact of the large-scale use of AI and machine learning by the above-mentioned players on potential service recipients and to identify the resulting consequences.

The article examines the changing conditions, barriers and threats to the operation of the online service sector. The authors seek to answer the question of where the line between pure service and abuse in the area of sensitive data collection runs, using the practices of digital giants MAAMA (Microsoft, Alphabet, Amazon, Meta, Apple) as an example. It is also important to determine the issue of fair distribution of profits generated from activities in the virtual space. For this reason, a discussion on the status of MAAMA is needed. The purpose of this article is to introduce five MAAMA entities, describe the specifics of their activities and attempt to assess their potential impact on the contemporary image of the city, the economic, political and social spectrum of the modern world (Jin et al., 2022). The analysis made by the authors draws attention to the lack of consistent legislation in the area of application of artificial intelligence and machine learning. It should also be noted the insufficient activity of political and economic centers in the world to develop such common legal solutions (Galloway, 2024; Gleiss et al., 2021; Mazur & Papirnyk, 2022). However, this impasse, after a long effort, was broken with the implementation of the AI Act legislation in the EU, which took place just a few months ago (March 12, 2024). This fact and its discussion in the last chapter bring an extremely timely spectrum to the overall problem.

The importance of MAAMA in the modern world is evidenced by the sheer numbers. MAAMA hange the present and tomorrow of the real economy and become its immanent part. Facebook has already surpassed 3 billion users worldwide in 2024–2025. Gmail has 2,5 billion users, Amazon 120 million users. Google's share. of the global search – engine market is dominant, reaching around 89–90% across all devices globally in 2025 (Statcounter…, 2025).

NOVELTY OF THE ARTICLE PRESENTED. THE STRUCTURE OF THE PAPER

This analysis of the topic implies the need for further research on MAAMA companies. In-depth research can yield valuable results from an economic, social and technological point of view due to:

- their potential economic impact and implications for smaller players and competitors;
- technological innovations in technology – artificial intelligence (AI) and big data analytics;
- issues related to data protection and the risk of information manipulation (it is necessary to systematically study how MAAMA companies control the flow of information);
- protection of competition – further analysis may be helpful in identifying prohibited monopolistic practices and related risks, as well as in understanding what actions should be taken to protect free competition in the market (Jin et al., 2022);
- the use of artificial intelligence AI – research on this issue can help understand the risks and benefits of automation and machine learning, as well as what regulations and law should be put in place to control the activities of these companies (Galloway, 2024; Gleiss et al., 2021; Mazur & Papirnyk, 2022).

The article consists of an Introduction (1) followed by two groups of subsections. The subsections are divided into two groups. The first group – introductory subsections – defining the characteristics of the presented scientific workshop, the second group of subsections are strictly substantive subsections on the activities of the MAAMA group. The whole is concluded with a bibliography.

The initial subsections (2–6) are introductory subsections, they present general information,

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

they are subsections defining the aim of the work, research problem, research questions, hypotheses, state of research – literature review.

The subsections of the second group (7–14) are the substantive subsections, where the activities of the MAAMA group are described, and the last subsection (15) – there are Discussion and the Conclusions drawn from the analyses, and the application values of the article are presented.

THE RESEARCH PROBLEM

Research on companies that are part of the informal MAAMA group (Microsoft, Alphabet, Amazon, Meta, Apple) is a relatively new topic. This state of affairs is due to the fact that all these companies have developed their activities in the 21st century. In a short time, they became dominant players on the world market, playing an important role in social, political and economic life. An important topic of research should be the impact of these technological giants on social life. Thanks to Facebook, users can connect with people from all over the world, share information and contribute to the creation of an online community. On the other hand, there is a growing concern about the privacy of data (personal data) that can be used for advertising, manipulative or political purposes. This state of affairs leads to numerous discussions about the appropriate regulation of these companies and the protection of users privacy. This is also an important issue in the political context. Also in this area, MAAMA has become an increasingly important factor in recent years (Jin et al., 2022). The reason is simple: these companies hold a huge amount of user data, which gives them a bargaining chip in shaping the way information flows, and potentially influencing political debates. For example, the phenomenon of disinformation and fake news, which are already of ten spread on the channels of social platforms, can be dangerous. In the longer term, this may have a significant impact on democratic processes and the conduct of election campaigns. Therefore, we should not be surprised by the growing interest in issues such as control and regulation of the activities of companies from the MAAMA group (Mazur & Papirnyk, 2022).

Last but not least, MAAMA has a huge impact on the global market also in the economic field. Entities belonging to this group create new technologies and technological innovations that change the way the global consumer uses products and services. One glance at the activities of these entities is enough: Google is an Internet search engine, Apple is a leader in the smartphone industry, Facebook dominates the social media market, and Amazon is an innovative – despite the passage of years – e-commerce platform. This can lead to concerns about the risk of monopolization, which in the long run can have a negative impact on innovation and consumer choice (Yuhashi & Morita, 2021). The above- entioned reasons make research on the activities and potential impact of MAAMA an exceptionally important topic, because the impact of these companies on social, political and economic life is significant. On the one hand, these companies offer consumers many benefits and innovations, but serious challenges must be taken into account, among which the protection of privacy, the potential impact on the activities of political entities and the threat of monopolization play a special role. Further research and discussion are needed to better understand the issue and respond effectively to its impact on society (Yuhashi & Morita, 2021). Considering the current global economic and socio-political landscape, it appears unlikely that significant changes in the status of MAAMA companies will occur in the near future (Gleiss et al., 2021). Despite efforts by European and American authorities to gain a comprehensive understanding of these entities and their data resources, various formal and legal restrictions, along with pressure from pro-company factions, make these endeavors time-consuming with limited effectiveness. Nevertheless, it is essential not to abandon such efforts. On the contrary, it is advisable to pursue as many of these proceedings as possible (Jin et al., 2022). Only through widespread actions undertaken by governmental institutions, non-governmental organizations, and associations can we hope to achieve a significant breakthrough in the behavior of these companies. Such actions can encourage them to become more cooperative and transparent in their operations (Mazur & Papirnyk, 2022).

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

The main scientific hypothesis of the article is to determine the correlation between social awareness of changes in the area of dynamically developing digital corporations and the development of artificial intelligence. The dynamics of change among the big five digital giants MAAMA exceed the absorption capacity of the social awareness of its service users.

The authors argue that this situation will become permanent, causing lasting social changes consisting in the partial digital exclusion of entire social groups and the consequences thereof. The authors intend to show that the development of artificial intelligence not only improves the comfort of service in many areas, but also poses a high risk of eliminating entire professional groups and changes in the area of existing forms of information delivery, and, as a consequence, the growing phenomenon of new, advanced digital exclusion in the near future.

The growing role of artificial intelligence is part of the development of modern information and service flows and results precisely from the acceleration of their global reach and needs.

In addition, attention will be drawn to the monopolistic position of those entities that possess one of the most valuable commodities today: user data. Through their activities, they influence the habits, attitudes, and actions of users.

LITERATURE REVIEW – DISCUSSION OF THE MAIN WORKS ON THE SUBJECT

The vast majority of the scientific literature on MAAMA was written between 2000 and 2023. Three periods can be distinguished in MAAMA research:

The first 2000–2012 – is basically the initial period, where mainly informative texts appear, devoted to the interpretation of the economic performance of these companies containing balance sheets and statistics on their growth and growing position in the world market. During this period, there were publications on social changes in the face of the encroachment of new technologies (Internet). The activities of the "Big Three" (still without Facebook) were treated almost exclusively in terms of network culture – not as independent economic entities. From this period, for example, we have two famous books by Manuel Castells – *The Internet Galaxy. Reflections on the Internet, Business, and Society* and *The Rise of The Network Society The Information Age: Economy, Society and Culture* (Castells, 2003, 2009).

The second period is 2013–2019, which can be called the pre-pandemic period. Here there was a flurry of texts on the dangers of the four companies' monopolistic practices and the battle between the EU and the U.S. over MAAMA taxation. Examples of literature from this periods include: *Global Technology and Legal Theory. Transnational Constitutionalism, Google and the European Union* (Guilherme, 2019), *The Uncertain Digital Revolution* (Andre, 2016), *Digital Transformation. Build Your Organization's Future for the Innovation Age* (Lindsay, 2017), *Deep Learning* (Kelleher, 2019). Finally, the last period counting from 2020, where we already have a different view, a different perspective not so much of growth, but of the unthreatened dominance of the „Big Vife" over the next decade, where the scientific discourse of the first and another period is supplemented by a another view, enriched by forecasting the results of MAAMA's large-scale application of artificial intelligence and machine learning in the near future. During this period we also encounter the most numerous representation of many items of literature on the subject (Shin-yi Peng et al., 2021), (Chopra, 2023; Sandua, 2023; Soltanifer et al., 2021; Sujon, 2021, Śledziewska & Włoch, 2021; Terry et al., 2023; Yazizioglu, 2024; Yuhashi & Morita, 2021).

MAIN IMS OF THIS RESEARCH AND MAIN RESEARCH QUESTION

The main purpose of the research is to show the rapidly changing spectrum of functioning in global markets, digital giants such as Microsoft, Alphabet, Amazon, Meta, Apple in OECD countries and the resulting consequences for the mass customer using their services. Another goal of the paper is to present the potential risks and dangers of MAAMA's solidifying monopolistic position in the world.

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

The primary research question of the paper is the dispute over the target role of artificial intelligence and the resulting consequences for consumers of MAAMA services, which may emerge as early as the next decade.

The question is de facto much broader – it is about the impact of AI- MAAMA on the economic and political life of the modern world and their access to sensitive data. According to Clotilde Marielle (Business consulting Director), two powerful factors cause MAAMA to invest on an unprecedented scale in the development of artificial intelligence (Marielle, 2021).

These factors are huge data resources and a very strong financial position of these giants. These companies invest in organic growth and through acquisitions of start-ups relying on their own laboratories and their own technologies. MAAMA buy out companies (Unicorns) with very high potential to become future network giants: there are about a hundred in the United States, almost as many in China, about three times fewer in Europe. Google uses artificial intelligence to refer to its products (Google Chrome search engine).

At the same time, Google opens up the sources of its artificial intelligence algorithms and offers a deep learning infrastructure (Paddle Paddle) with various building blocks. By December 2020, more than 230,000 deep learning models had been created. MAAMA use the data they collect to improve their algorithms and targeting technologies (Google, Amazon), their products and services (Apple, Amazon), or to generate advertising revenue (Facebook, Google).

The complex situation in the area of artificial intelligence implementation was also pointed out by Paweł Czajkowski (2022). He states that "large language models and other tools based on artificial intelligence technology are developed by searching through vast Internet resources and sucking in huge amounts of data. Currently, this issue remains legally unclear." The analyst points out, for example, that following the change in Google's privacy policy, the company is free to use in its datasets – to train its AI systems – any information available on the Internet, regardless of the platform on which it was published. This also applies to texts stored in the cloud. Therefore, there is a synergistic effect – the more data MAAMA have, the faster they test their machine learning models (Burtan, 2019).

MATERIALS AND METHODS

The non-use of traditional research methods such as quantitative methods in this article is due to the permanently changing situation in the research area (i.e. the activities of the MAAMA group). In our paper we are not dealing here with a historical and closed research problem.

For the problem and the field of research are changing before our eyes. The information reaching us via the Internet and the media – mainly digital – in the research area in question is changing its picture practically on a daily basis. Hence, survey research could not be used either, as public awareness of the research issue is also changing and maturing, almost on a daily basis. The main methods of work are:
– analysis and criticism of the literature,
– the method of document research,
– current media reports and Internet information,
– meaning the observational method,
– heuristic methods and techniques,
– behavioral and experimental methods.

These methods aim to identify changes in social behavior, in the rapidly changing space-time of Internet services. This includes emerging conflicts and a growing wave of lawsuits, against the backdrop of inadequate protection of sensitive data, such as image protection or speech.

THE ORIGINS AND DEVELOPMENT OF THE MAAMA ENTITIES

Google (Alphabet)

In 1995 two mathematicians, an American, Larry Page and a Russian, Sergei Brin, met at Stanford University. The result of the joint creation of the BackRub system (using the groundbreaking PageRank algorithm, 1996) (Brin, Page 1997). A year later, it was given the name Google, which starts with the mathematical term googol, which means number 1 and

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

100. This reflects the infinite amount of information present in cyberspace September 1998 saw the inauguration of Google Inc Page became its president, and Brin became its director. The following year, the company moved to its current location, Mountain View.

The year 2000 brought an extension of the search engine's business model with the auctioning of keywords, thanks to which content was searched on the Internet. The effect was to generate significant profits. It is considered that the absence of this type of solution was the reason for the failure of previous content search initiatives.

A system based on paying for an actual "click" on a promoted link, not just for seeing it, was similarly effective. As a result, advertisers were able to obtain measurable results for their advertising campaigns. Thus, in 2002, Google adapted an unpatented model to its services. This led to a monopoly position in the field of online data search (Baraniewicz, 2017). In the same year, the search engine was characterized by a daily service of over 100 million queries (see Fig. 1). The following years saw the launch of Gmail (2004), Google Earth (2005), Google Maps (2005) and the acquisition of YouTube (2006) and the start of the Chrome browser.

Over time, Google has established its position, increasing its impact. Evidence of the company's power is, for example, the fact that since 2020 it has introduced fees for handling requests for access to data on specific individuals to American courts, police, prosecutors, etc. According to the existing price list, 60 dollars cost to make available data that will allow for wiretapping as part of an investigation (such as recordings associated with a given account and additional information on geolocation). In turn, USD 245 costs the provision of data that will enable a search warrant to be issued (the company from Mountain View will then provide access to the e-mails of the person who is suspected of a crime). This step is explained by the growing number of inquiries from the services – in 2019; there were 75 thousand such requests relating to 165 thousand accounts (Dyka, 2020).

In the first quarter of fiscal 2024, Alphabet achieved revenue of $80.5 billion, representing a 15% year-over-year increase. This data confirms the company's rapid growth and its ability to maintain a strong position in the global technology market. The revenue structure demonstrates clear diversification – in addition to key search advertising ($46.2 billion), YouTube ($8.1 billion), the Google Cloud segment ($9.6 billion), and Google Play ($8.7 billion) all contribute significantly. This model not only allows Alphabet to mitigate the risks associated with reliance on a single

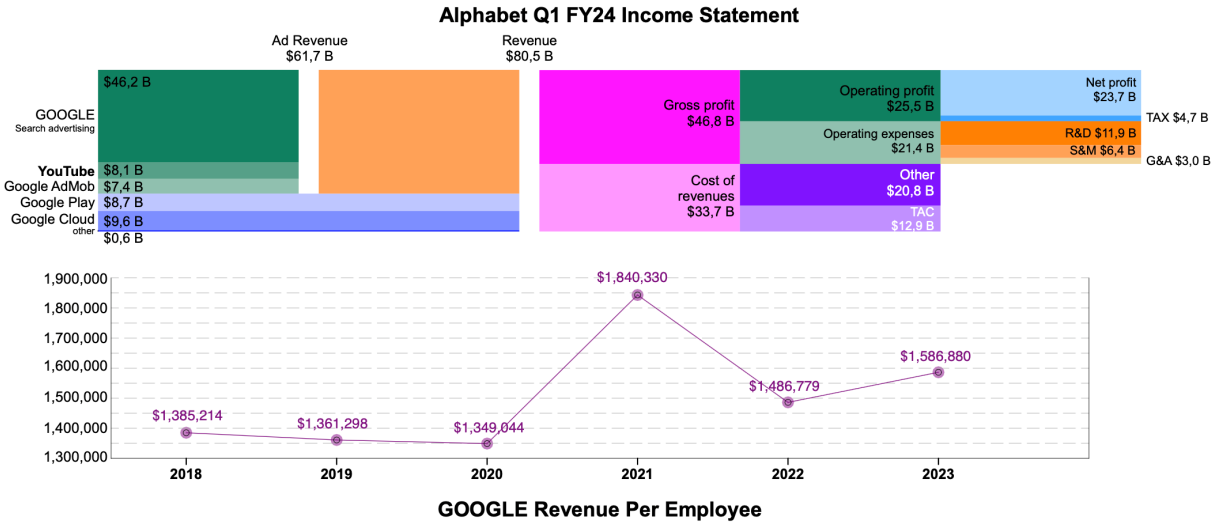

Fig. 1. Alphabet Q1FY2024 Income Statement and Google Revenue per Employee 2018–2023
Source: Author's own graphic design based on (FourWeekMBA, 2024).

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

business area but also ensures financial stability and resilience to the market volatility characteristic of the new technology sector (see Fig. 1).

Amazon

Amazon is a online sales company founded in 1994 by Jeff Bezos. He took advantage of the situation prevailing at that time, noting the existence of great potential in Internet sales (at that time, the growth of Internet users was at the limit of 100% per year).

The success of his project was also determined by the fact that he did not have to face any competition. Bezos decided to sell books because of their large number on the global market and the possibility of creating an extremely rich offer for potential customers. In 1998, his company started selling DVDs, CDs, and in 1999 it expanded its range to include toys, electronic equipment, board, and computer games and software. Another good move was the idea of making available to other entities a ready-made, the properly prepared infrastructure of a storage and logistics nature. This translated into the possibility of "displaying" on the Amazon website products of other retail companies. These entities can also use the warehouses and the entire logistics facilities of the company. It is estimated that at least two million small businesses use such services (see Fig. 2). Amazon was also the first to facilitate purchases. The service has no misleading or unnecessary tabs – everything

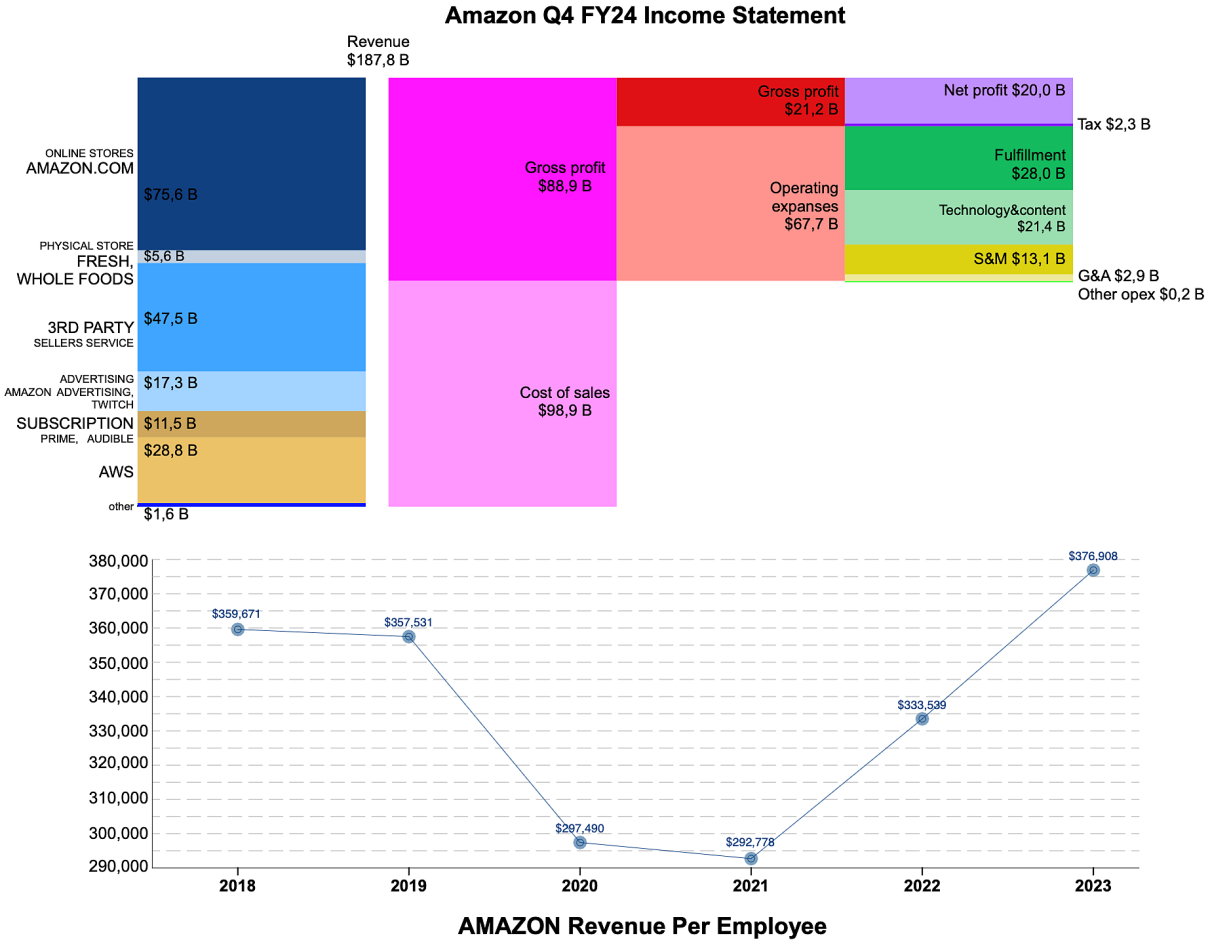

Fig. 2. Amazon Q4 FY24 Income Statement and Amazon Revenue per Employee 2018–2023
Source: Author's own graphic design (compilation of two charts) based on (FourWeekMBA, 2024).

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

is as simple as possible. Searching for goods is intuitive, and after making purchases, the person using this option to purchase products is automatically directed to the payment site (Kryśkiewicz, 2017) (see Fig. 2).

Bezos attaches great importance to innovation and technology development, resulting in the implementation of many revolutionary concepts. It was Amazon who initiated the implementation of numerous functions that are currently used by online shops. These include: proposing a set of useful accessories or accessories and similar products, informing about products that have been purchased by other people showing interest in similar goods, recording the history of purchases and goods viewed in the past by the customer.

The next revolutionary step of Bezos is the popularization of cloud computing services. Amazon was one of the first companies to make its computing power from the server room available to external companies, which proved a successful venture. Due to the growing competition, it is difficult for Amazon to stand out in the modern market. Still, Amazon effectively uses the possibilities of modern technology, offering numerous innovative solutions to its customers. The importance of this model is confirmed by the fact that it is treated as a kind of barometer of the industry because sales modifications usually reflect the changes taking place in all Internet trade (Wixforth, 2019).

Amazon generated revenue of $187.8 billion in the fourth quarter of fiscal 2024, representing a 10% year-over-year increase. The revenue structure demonstrates exceptionally broad diversification – in addition to online sales ($75.6 billion) and third-party seller services ($47.5 billion), advertising ($17.3 billion), subscriptions ($11.5 billion), and the development of the AWS segment ($28.8 billion) all contribute significantly. This demonstrates that Amazon is no longer just a logistics or retail company, but a technology conglomerate with a complex business model that combines e-commerce, cloud services, digital media, and advertising, ensuring resilience to changes in individual market sectors.

Facebook (Meta)

Facebook has been found by a Marek Zuckerberg (programmer). During his studies, Zuckerberg developed the CourseMatch application, which makes it easier to sign up for the given subjects (Kowalska, 2017). In 2004, the first version of Facebook appeared (Brügger, 2015). October 2005 was the time of launching Facebook Photos and in 2006 the first mobile version of the site was launched. In 2009 brought the addition of the most characteristic element of the portal – the "Like it!" button. In 2012, Facebook bought Instagram (M&A) and has been listed on the stock exchange. In 2012, Facebook bought Instagram for a billion dollars, which gives the opportunity to upload photos to the Internet and share them with others. In the same year, Zuckerberg's company was listed on the stock exchange – at that time, the portal boasted a billion users. Also Facebook Messenger has become extremely popular (Czubkowska, 2018). It is undisputed that a serious threat of using this portal is the lack of control over the sharing of data by users. When creating a virtual social profile, a person wants it to be as attractive as possible. After providing basic data, the service uses various techniques to encourage active use of the available Facebook (Meta) tools (see Fig. 3). Analytic programs are used to collate any information provided by a particular Internet user and compare it with a database. This gives the opportunity to propose new acquaintances that fit in with the person's preferences (Kurzak, 2015). Facebook also has a psychological effect, as it keeps you informed about the activities of those who have been joined by you as friends.

Therefore, there is an impact of competition syndrome, which is manifested by the creation of new content by other users, which leads to the whole mechanism. It is also very important that Facebook gains a huge amount of valuable data, which it can have at its disposal in various ways (Kasprzak, 2018).

In the third quarter of fiscal 2024, Meta reported revenue of $40.6 billion, representing a 19% year-over-year increase. However, the structure of funding sources shows limited diversification, with a whopping $39.9 billion coming from advertising within the social

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

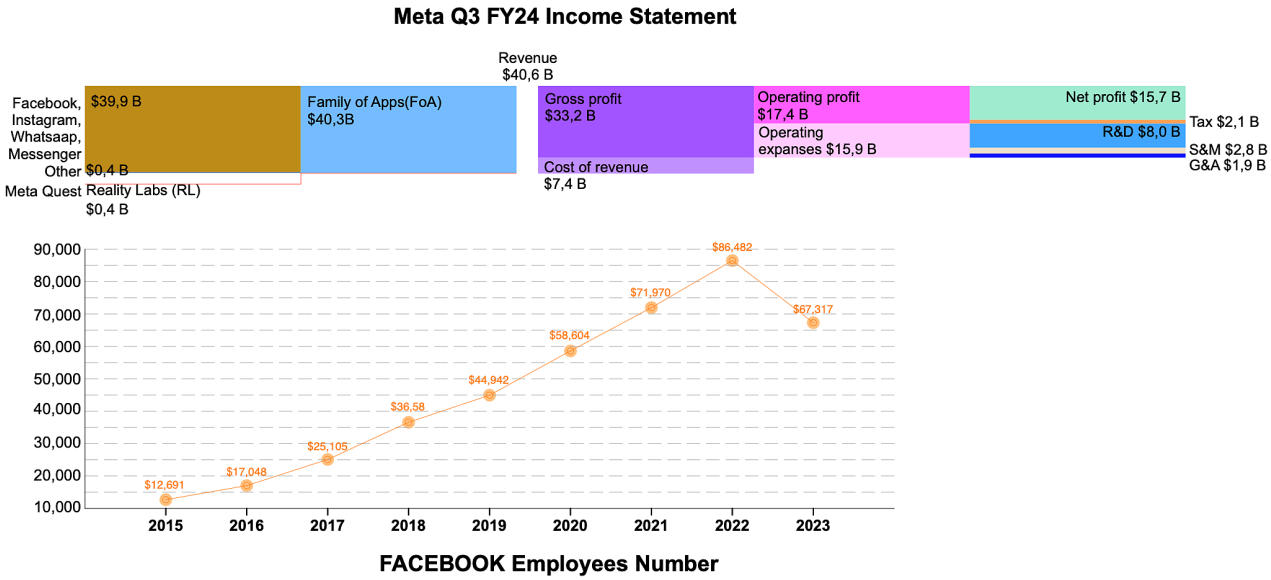

Fig. 3. Meta Q3 FY24 Income Statement and Facebook Financial Reports – Facebook Empployees Number 2018–2023
Source: Author's own graphic design (compilation of two charts) based on (FourWeekMBA 2024).

media ecosystem (Facebook, Instagram, WhatsApp). Other segments, such as Reality Labs ($0.3 billion) and payment infrastructure, have a marginal share and generate losses. This means that Meta's business is still predominantly based on monetizing advertising traffic, and attempts to expand its business model do not play a significant role in overall revenue.

Apple

Apple's revenue reached $85.8 billion, a 5% increase year-over-year. Revenue diversification is clear – products generate $61.6 billion (2% increase year-over--year), and services $24.2 billion (14% increase year--over-year). Services are growing significantly faster than products, demonstrating the growing importance of this category for the company. Among products, iPhones dominate, generating $39.3 billion in revenue. Gross profit reached $39.7 billion with a 46% margin. Operating profit was $25.4 billion with a 30% margin. Net profit totaled $21.4 billion, a 25% margin. Cost of revenue was $46.1 billion, and operating expenses were $14.3 billion. The latter primarily comprised research and development (R&D) costs of $8.0 billion and selling, general, and administrative (SG&A) expenses of $6.3 billion.

This company is almost automatically associated with S. Jobs, who together with Steve Wozniak founded Apple (1976). The result of this Joint was, among other things, the creation of the Apple II computer (1977). The following years were marked by the implementation of new products – for example: Macintosh computer, Power Book. Especially the first iMac attracted attention with its appearance – it was the aesthetic issues that were strongly emphasized by Jobs (see Fig. 4).

A whole series of original products appeared, including e.g the iBook, G4 Cube and the iPod (2001). In 2007 has been released the iPhone – one of the most recognizable products (Kilar, 2009).

It is noteworthy that in the case of all the organizations discussed, their creators have shown farsightedness, openness to innovative actions, taking advantage of opportunities to improve their market position, a clear vision of operation and the conviction that a virtual sphere is a place of unlimited possibilities when it comes to winning customers. Such features combined with a certain ruthlessness in the field of business and controversial behavior (vide: Zuckerberg) have made the described companies a kind of "dictators" in the contemporary market (see Fig. 4).

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

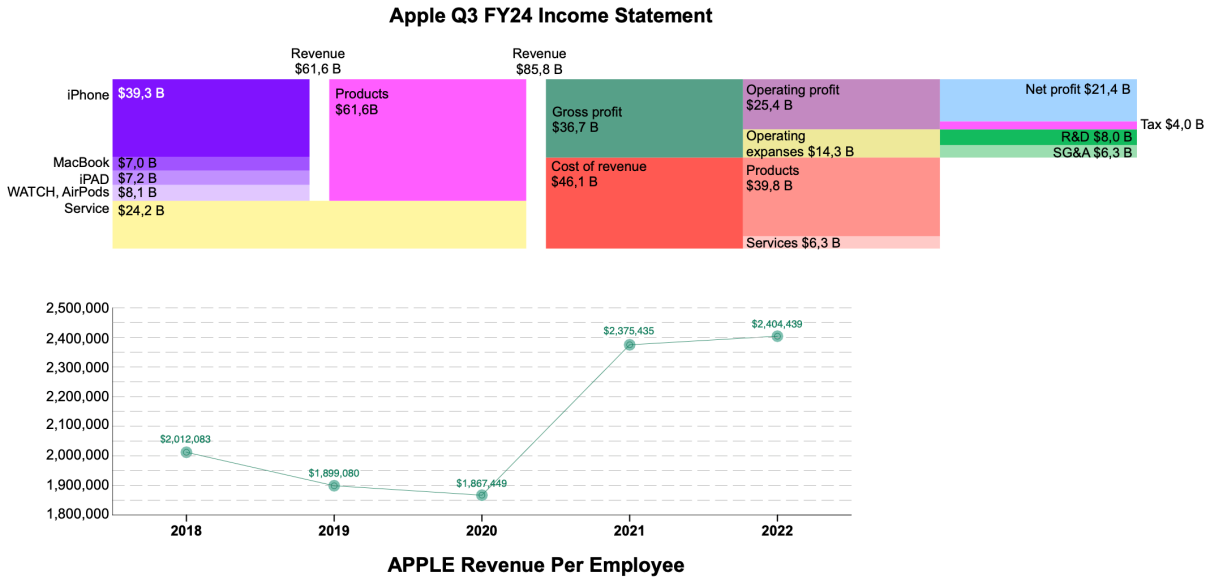

Fig. 4. Apple Q3 FY24 Income Statement. Apple Business Model and Apple Revenue per Employee 2018–2023
Source: Author's own graphic design (compilation of two charts) based on (FourWeekMBA 2024).

Microsoft

Microsoft Corporation is another global technology giant. Its business activities focus on software development, cloud services, and computer hardware production. The key revenue sources remain the Windows operating system and the Microsoft 365 office suite, offered via a subscription model. The Azure platform also plays a significant role, being considered a leader in the cloud services market, competing directly with Amazon Web Services and Google Cloud. The company is also developing the video gaming segment through the Xbox brand and Xbox Game Pass services, and the acquisition of Activision Blizzard strengthened its position in this industry. Microsoft is investing in artificial intelligence solutions, including through its partnership with OpenAI, integrating AI models with office products and cloud services. The company operates in over 190 countries, generating diversified revenue from both the consumer and enterprise markets, making it one of the most influential players in the global digital economy. In the third quarter of fiscal 2023, Microsoft generated revenue of $52.9 billion (+7% year-on-year), with the largest share coming from the intelligent cloud ($22.1 billion, +16% year-on-year), followed by productivity and business processes, including Microsoft 365 and LinkedIn ($17.5 billion, +11% year-on-year), and the "More Personal Computing" business, including Xbox and Windows ($13.3 billion, 0% year-on-year).

Cost of sales was $16.1 billion, resulting in a gross profit of $36.7 billion (69% margin). Operating profit reached $22.4 billion (+10% year-on-year, 42% margin), and net profit was $18.3 billion (+9% year-on--year, 35% margin). The largest operating expenses were spent on research and development ($6.0 billion) and sales and marketing ($5.8 billion). The results confirm the growing importance of the cloud and the stability of the consumer segment (see Fig. 5).

MAAMA'S DOMINANCE ON THE MARKET

The companies described operate in various areas of the modern market, and their influence on global politics and economy leads to a growing opinion that they are the entities that determine the functioning of the modern world. This is a consequence of the fact that they serve billions of people, providing them with the most needed elements of their current existence. In the case of Google, this is knowledge, Amazon

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

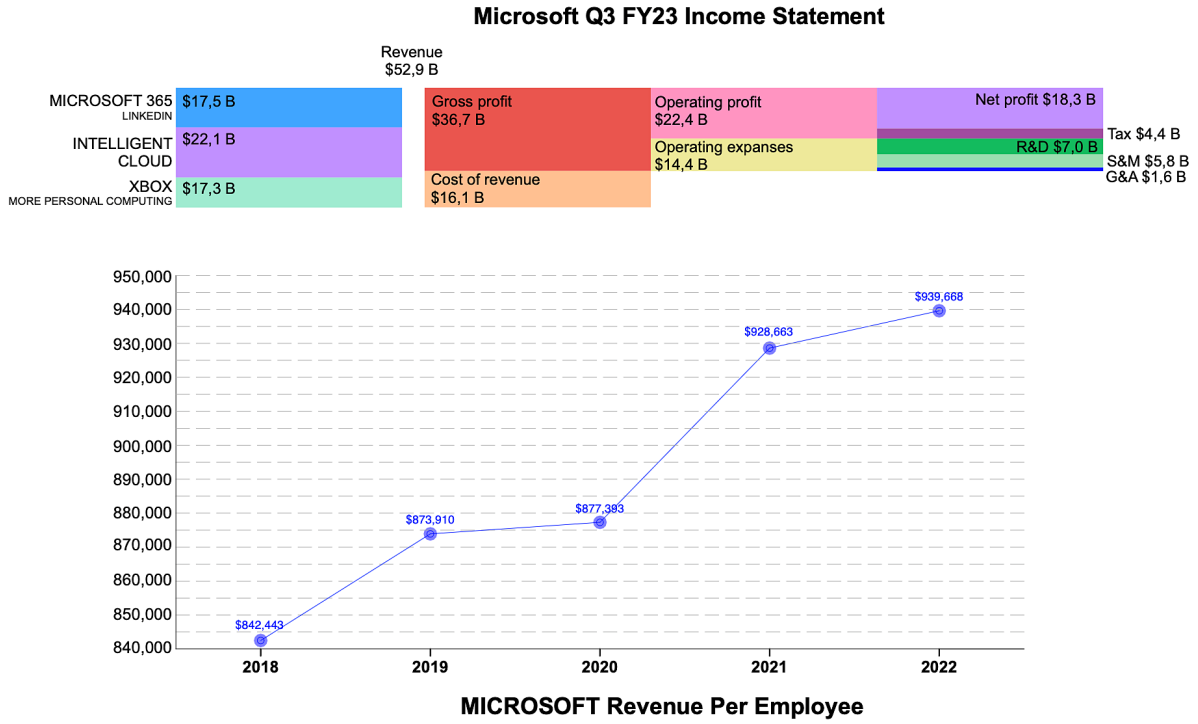

Fig. 5. Microsoft Q3 FY23 Income Statement and Microsoft Revenue per Employee 2018–2022
Source: Author's own graphic design (compilation of two charts) based on (FourWeekMBA 2024).

is in the supply of goods, Facebook is in contact with other people, and Apple's domain is mobility and entertainment. This is a natural simplification, but it is justified to take such a synthetic approach to the field of MAAMA activity (Burtan, 2019). Referring to history, it is worth emphasizing that the ruling layers usually had great assets. The same applies to the companies under analysis, because people who are owners or main shareholders have personal assets calculated in billions of dollars.

It should be added that in the last three years, there has been a doubling of the capitalization of these companies, which makes their total value estimated at 3 trillion dollars. It is interesting to note that the MAAMA is dedicated to the four incarnations of the modern human being. And so, for example, the intelligent man (homo sapiens) uses Google, the buyer (homo emptor) uses Amazon, the social man (homo socius) is a Facebook user. In contrast, the fun man (homo ludens) uses the options offered by Apple products (Tadeusiewicz, 2020). Having such great power fosters behaviors that are ethically questionable. Facebook, for example, is a place where various news items are distributed. Despite the declarations of elimination of such reports, effective mechanisms for the immediate removal of such items have still not been developed, which can be used by various circles to disseminate ideas that may be beneficial to them. This includes a variety of automated propaganda and disinformation campaigns. It is pointed out that companies such as Google and Facebook should work more closely with trusted and independent fact--checking organizations. This has been highlighted by the European Union, among others. Currently, the availability of data held by the MAAMA is still far from being desirable, sporadic, and arbitrary, making it impossible for impartial investigators to act effectively. At the same time, companies referred to as the MAAMA are consolidating the conviction of their "integrity" and being above Power (Usidus, 2019).

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

MAAMA AND THE CHALLENGES OF MODERN URBANIZATION

The dominance of today's digital giants, especially in this case Google, touches and even encroaches very strongly on areas of traditional urbanized space in almost all its aspects. These are both virtual guides to cities and museums activated by an application and a QR code, as well as virtual maps – Google Maps, where we can not only see the real 3D image of the area indicated on the virtual map, but also have the possibility to know the time needed to get to a given, searched place without error (taking into account the current delays or incidents on an ongoing basis entered in the listings) (Arundell, 2018).

The current generations Y and Z of young people, grown up on the Internet revolution, today's 20- and 30-year-olds hardly use traditional city plans and maps. Almost entire young generations can no longer correctly align a paper map with regard to the world's directions, let alone find their location according to a grid of roads and streets and landmarks in the field and on a map, which not long ago was a part of the elementary skills of every aspiring scout. Nowadays, after the emergence of the Internet's benefits, tourism in all cities has also changed significantly, especially in historic cities. The charm of these cities, their beauty – compositional qualities, are no longer contemplated as they used to be, as tourists, in their mass, keep a closer eye on their phone screen than on the architecture, for fear of getting lost (Doytsher et al., 2010; Fuchs et al., 1994). The presence of the Goggle Maps service, in either a complete or limited formula, is also perceived by potential tourists as an additional recommendation in favour of the attractiveness of a given place and the present or absent broader tourist infrastructure. As a result, this information can and very often does decide, it must be emphasized, not to include such a place (with limited Google Maps service presence) in the travel plans of a potential tourist. This is the case even when, objectively speaking, there is an outstanding UNESCO-listed urban ensemble. Such an example would be the very well-preserved ancient city of Thugga in western Tunisia (the situation described took place before 2010). These social behaviours are difficult to define other than psychological barriers, which translate into spatial barriers even though they only occur in virtual space, after all. Increasingly, mapping out the location and route of a holiday trip by oneself (we are talking about all the logistics of this task) is becoming a significant difficulty discouraging people from undertaking this task at all. We expect artificial intelligence to do this task for us.

THE SPATIAL EFFECTS OF THE VIRTUAL OPERATIONALIZATION OF THE REAL ESTATE MARKET

Few researchers point out that the crisis of the turn of the century, if the global economic crisis of 2008 can be called so (Orlowski, 2010), was rooted (as the first in history) in economic decision-making based on virtual information, although, of course, not only, nevertheless the role of the Internet was significant here. For several years, the virtual services of real estate agents have strengthened their attractiveness of online offers and now after 2020 (after the entry of new programs for artistic processing of photos and videos) we can talk in the case of the real estate market, about making a purchase decision in front of the monitor of their computer or laptop, and not during a visit to the sold property, as is estimated by nearly 50% of customers already (although such a visit is still the standard). The 2019–2021 pandemic crisis has translated into an activation of the global labor market. Factors with roots back to the end of the 20th century, such as the decline in transportation and communication costs, numerous reforms of the strongest Far Eastern economies (China, India, Japan), and repeated trade liberalization within the WTO, which led to a reduction in the weighted average tariff rate to 4% (2010), also contributed to this.

The deepening phenomenon of the relocation of entire industries to regions with lower labor costs was also of considerable importance. And although the latter trend reversed after the pandemic crisis, it is another factor in favor of increased migration –

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

this time labor migration to countries in Central and Eastern Europe, and, after the outbreak of the large-scale war in Ukraine, increasingly to Vietnam or Indonesia.

THE NEW ATTRACTIVENESS OF REGIONS – THE "WANDERING MIDDLE CLASS" AND DEMOGRAPHIC PROBLEMS

As a by-product of the pandemic era, a new phenomenon of a "wandering middle class" has emerged globally in recent years. Thanks to the developed global labor market and the growing capabilities of the Internet (including the rapidly growing market for interactive MAAMA products), a New Middle Class has emerged that is not spatially tied to its family environment. This group (freelancers), nominally small but very active online, with significant social media clout, has inspired a broader trend, the initiation of an international fashion for combining work and relaxation outside of one's local environment. This group includes numerous professions. It is composed mainly of well-educated freelancers, including mainly programmers, but also computer graphic designers, designers, advertising workers, writers, screenwriters, film workers and even lawyers or architects (Młynarska-Sobaczewska & Zaleśny, 2022). They conduct their professional activities online from places hundreds and sometimes thousands of kilometers away from their local home communities. They choose locations that are attractive to them. These are not always touristic places, they also often choose those that provide peace and quiet, a relatively high standard of services from the hospitality sector, at appropriately inexpensive prices, respite and relaxation after many hours spent over the computer. The decision to join the "wandering middle class" entails postponing many personal and family decisions. They decide much later to start a family, since this would entail precisely the broader functioning in the local community and the need for various forms of benefits for the family and neighborhood community, which they are not building at the time, but also do not use. The shift in the decision to start a family to later in life than has been the case so far is clearly revealed by OECD data (see Fig. 6).

As a result, in recent years (2018–2024), this phenomenon translates into a deepening demographic crisis in many countries, traditionally, with high human capital.

These are very often the countries of the old continent (Spain, Italy, France, Poland, Lithuania),

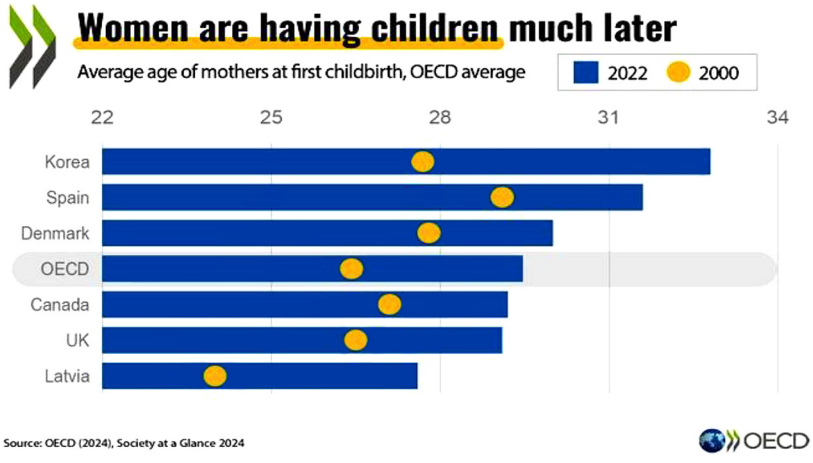

Fig. 6. Women are having children much later than two decades ago, having their first child at 29 years old on average across OECD countries in 2022, compared to 26 years old in 2000

Source: OECD (2024), Society at a Glance 2024.

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

where fertility rates in middle-class families have fallen dramatically below replacement rates. Caroline Anders (Anders, 2024), a correspondent from France, alarms in 2024 that: France's population is older than ever, and its citizens are having fewer and fewer children. Only 678,000 children were born in the country last year (2023), the lowest number since 1946. According to INED, France's National Institute for Demographic Research, the decline is mainly due to women having fewer or no children. The country's population grew slightly last year thanks to migration and a record high life expectancy of 85.7.

In turn, Adam Mallach (Mallach, 2024) notes that we are dealing with cultural changes. He points out that: "Countries with family-friendly policies, such as child tax credits and paid parental leave, continue to see declining birth rates. There is some evidence that these policies increase the number of children born when they are first implemented (…) but the gains are temporary. 'No matter what governments do to convince them to procreate, people around the world are having fewer and fewer children'".

The changes in question (Berrington et al., 2024) are due to Generation Z's different approach to fertility in general. Having children is, unfortunately, no longer part of the ethos of intergenerational priorities in the youngest adults (18–25), and this is not even dictated by environmental concerns, but is driven purely by personal calculations:

The results suggest that today's young adults (Gen Z, currently aged 18–25) are much more likely to intend to remain childless compared to earlier generations at the same age. This indicates that fertility rates might fall further in the UK. However, concern for the environment is only associated with intentions to remain childless among older millennials (those currently aged 36–41), once other factors are taken into account. For younger adults, the decision to not have children doesn't appear to be linked to environmental concerns.

The widespread shift in the decision period for having children has emerged with the logistical possibilities of remote work and the new capabilities of the Internet. It has also been beneficial in hiding the progressive growth of unwanted childlessness as a disease of civilization. It is estimated that nowadays already nearly 20% of couples – the example of Poland – (Oleszczuk, 2021) cannot naturally live to see their offspring. At the same time – the escape into late parenthood – allowed to avoid the stigmatizing social assessment very strongly present even 20 years earlier as lazy, poorly organized, unable to cope with life (Szymańska & Wylon, 2019).

Research participants who read stories about a couple childless by choice rated the man as less driven and caring than a spouse in involuntarily childless marriage or marriage with children. The same results were obtained for a female member of a couple. Furthermore, both voluntarily childless men and women were seen as less emotionally healthy than those who have children. It is worth noting, however, that the parents were rated on the scale of emotional health significantly above both voluntarily and involuntarily childless spouses. Which confirms that not only voluntary childlessness, but childlessness in general, May be adiscrediting attribute for couples (Cieślińska, 2014; Miall, 1986; Przybył, 2003) (see Fig. 7).

THE ROLE OF MAAMA AND AI IN LAND MANAGEMENT AND EFFECTIVE LAND ADMINISTRATION

Artificial intelligence and digital technologies are changing the management of space in front of our eyes, and are having a significant impact not only on agriculture, but also on elements of the condition of buildings, the settlement network, and finally urban greenery (Golenia et al., 2016; Jarocińska et al., 2018). Nowadays, artificial intelligence-based solutions are increasingly supporting the right decisions to optimize fertilizer use by recognizing levels of, for example, nitrogen in both soil and plantings. Today's digital processing capabilities of aerial photos allow the creation of detailed maps of soil moisture, the study of crop nutrient levels, or the overall condition of crops (Jarocinska, 2014). Farmers can fight pests or plant diseases more effectively (Migas-Mazur et al.,

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

2021). Using computer technology, predicted yields can be calculated, in agriculture, by analyzing weather data and soil conditions. Autonomous AI-controlled agricultural machinery programmer units provide new opportunities in jobs such as weeding, planting and harvesting (Rzeźnik et al., 2023).

Similarly, many innovative solutions have been introduced in recent years in the field of forestry, which, supported by remote sensing, makes it possible to observe, protect and maintain the biological balance of ecosystems. It is now possible to accurately assess the condition, or density, of forest stands and identify their age without invasion. Artificial Intelligence is now increasingly being used to optimize reforestation, monitor forest resources in the context of fire protection, verify ecosystem biodiversity, or simply manage forest areas (Galloway, 2024; Mishra et al., 2023; Młynarska-Sobaczewska & Zaleśny, 2022; Zagajewski et al., 2018).

Also in the construction, land use and urban planning sectors, new opportunities are emerging thanks to artificial intelligence. New technologies for zero-emission construction are emerging. New technologies, but also materials, are emerging that reduce the carbon footprint. These include, for example, high-performance energy systems and systems for supplying buildings with various technical infrastructure systems. Already at the level of applications and software optimizing investment processes and building operations, we now have the opportunity to take advantage of a growing number of tools, devices and machines powered by AI solutions. Programs for whole building lifecycle design are emerging in the construction sector. They are generally integrated with the management and supply of energy and the environmental impact of a given building throughout its life cycle. It should be recalled here that the construction industry (worldwide) is responsible for producing nearly 40% (38%) of all global CO_2 emissions. New solutions are helping develop roadmaps to achieve decarbonization of the construction industry by 2050. High hopes are being placed on artificial intelligence in developing technologies for new building materials. Expectations are particularly high in the search for new solutions, for new green building materials, applicable to the design of green roofs and walls, or in the creation of renewable energy sources for

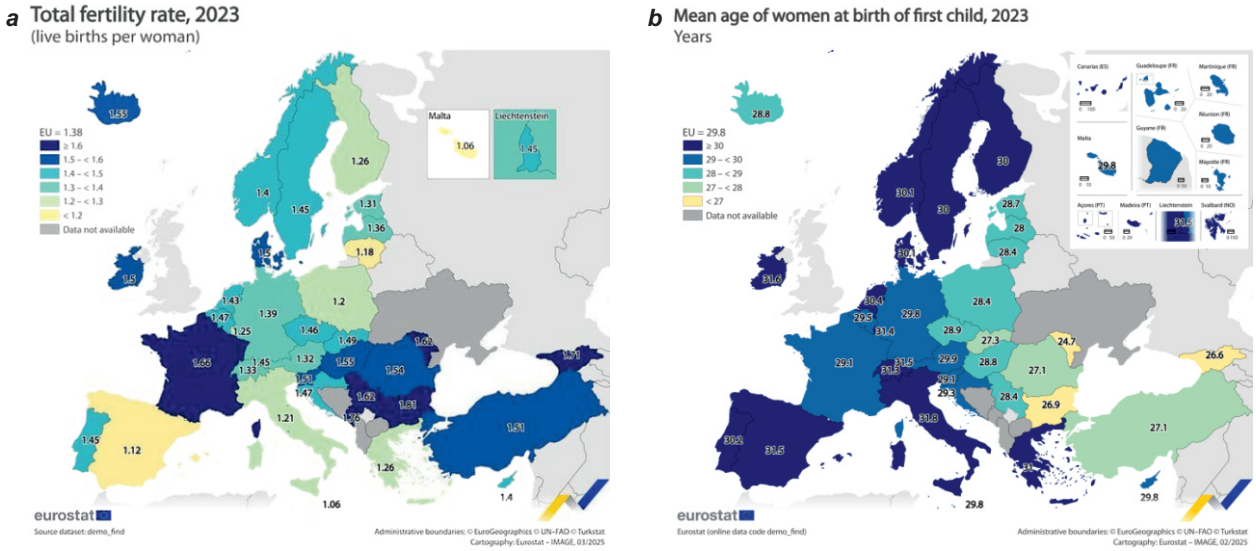

Fig. 7. (a) The total fertility rate in 2023 was 1.38 live births per woman in the EU, down from 1.46 in 2022; Highest in Bulgaria (1.81) and France (1.66), (b) Mean age of women at birth of first child, 2023
Source: Eurostat, 2023.

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

a single house in single-family housing. Smart home management systems are now very advanced. In terms of new technologies in construction, a method of carbonation has emerged that allows carbon dioxide to be fixed in concrete blocks using an automated system under atmospheric pressure. New technologies are available for private buildings and public buildings to automatically detect water leaks in plumbing systems and remotely track water consumption. Very interesting research projects of recent years include, for example, techniques for estimating and identifying asbestos roofs. Asbestos as a carcinogenic material is to be eliminated from use by 2032 (data for Poland). Information on asbestos-cement roofs is obtained during field work (Galloway, 2024; Krówczyńska et al., 2020; Krówczyńska & Wilk, 2023). A new convolutional neural network (CNN) architecture is used. The study uses orthophotos with a spatial resolution of 25 cm. Area classification is carried out using aerial photographs in RGB composition.

Building Information Modeling (BIM) technology should also be mentioned. There is a strong recent acceleration toward increased efficiency and new BIM capabilities. These are driven by innovative trends that will soon redefine the entire architecture, engineering and construction (AEC) industry. Key applications of BIM, include prefabrication, modular construction, mobile BIM and multi-dimensional simulation, capable of determining the various phases of a project's life cycle from the concept phase to maintenance needs during the lifetime of an already built facility (Mahajan & Narkede, 2024).

There are also separate solutions for businesses operating in the construction sector, knocking down the correlation of potential profit projection with a path towards climate neutrality. Artificial intelligence and deep machine learning (ML) algorithms are being used to manage logistics processes in order to strengthen the efficiency of construction companies while maintaining sustainability goals.

In addition, mention should be made of improvements in the ability to provide access to data on land records. Online geoportals provide information not only on the size and location of land parcels, their registration numbers, but also on their land use, the occurrence of tree canopies and plantings, as well as some records of detailed spatial decisions made in municipalities (Barsukova, 2025; Stefaniak, 2018).

MAAMA IN THE SPECTRUM OF CRITIQUE – FUNDAMENTAL DILEMMAS ARISING FROM THE STUDY

Nowadays, MAAMA (Microsoft, Alphabet, Amazon, Meta, Apple) are undoubtedly one of the most important players on the market of modern technologies and the Internet. However, their activities are not without controversy. A good example of that is the Cambridge Analytica scandal, where Facebook was criticized for helping to share user data for use in political marketing (Andretta, 2020). Concentration and monopoly risks have also been a growing concern in recent years. Google, on the other hand, has been accused of monopolistic practices and manipulation of search algorithms over the years. Amazon has become the object of controversy due to the working conditions in warehouses (admittedly, this does not apply to strictly digital activities). Apple has also been criticized for its practices on the App Store platform, which may potentially limit competition. One way or another, these are companies that contribute to technological development and are pioneers of numerous innovations (Andretta, 2020; Galloway, 2024; Młynarska-Sobaczewska & Zaleśny, 2022).

The objective of this work was to explore the global influence, risk and opportunities of MAAMA companies such as: Google, (Microsoft, Alphabet, Amazon, Meta, Apple). This has been accomplished by analyzing various sources (e.g. books, newspapers, and online publications) related to this subject. A concise overview of the origins and growth of these "Big Five" companies will be provided, highlighting their contributions to the development of modern technologies, which have greatly impacted society. Through their activities, they possess the power to influence user habits, attitudes, and action. Although attempts have been made by the United States to counter the dominance of MAAMA (Microsoft,

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

Alphabet, Amazon, Meta, Apple) in the market, these efforts have thus far remained in the initial stages.

Mention will be made of ongoing proceedings by the Department of Justice, the Federal Trade Commission, and the House Judiciary Committee's investigation. Furthermore, Senator Warren's proposal to limit their monopoly will be discussed. In conclusion, skepticism will be expressed regarding the likelihood of significant changes occurring in the current landscape.

The authors identified 3 basic dilemmas resulting from their research concerning the leading position of digital technology giants MAAMA. These are:

1. Restrictions on promoting competition – strengthening their own monopoly positions and countering attempts to tax them adequately for their position.
2. Operating an ever-widening base of sensitive data and managing it outside of sufficient control regulations.
3. GAFA's growing influence on the global economy and politics and the resulting consequences (with the large-scale use, by these companies, of artificial intelligence).

The scale of the dilemmas outlined above is best demonstrated by the fact that the heads of U.S. tech giants – Facebook, Amazon, Google and Apple testified in 2020 before the U.S. Congress as part of an ongoing investigation into the dominance of these digital platforms in global markets. The investigation was meant to answer the question of whether MAAMA are engaging in anti-competitive practices to the detriment of smaller digital rival companies (Radosavljevic, 2020). In the case of Apple and Amazon, it's their sales platforms (the App Store on iPhones and iPads and the e-commerce site for Amazon) that are under the close scrutiny of U.S. Congressional representatives, as those companies are both hosts and sellers. By contrast, Google and Facebook, which account for most of the world's digital advertising revenue, provide (theoretically) commission-free services that have become dominant in their niche (such as the search engine or YouTube platform for Google) (Allal-Cherif, 2020).

Users' interactions with these products enable these giants to collect data on their profiles and sell precisely targeted advertising space on a very large scale. Samuel Stolto on the (EUROACTIV) site, in an article Commission eyes US GAFA (MAAMA) hearing for future competition challenges points out that the battle is about allowing other players into the market. As a result, a new structural tool was developed at the turn of 2020 and 2021 to support MAAMA inspections – but without the introduction of infringement rulings or the imposition of fines (Alaux, 2019; Le Maire, 2019). In the first dilemma we also have the issue of taxing the giants which the United States opposes, since all the big four are, after all, American companies. A dispute between the (then) Donald Tramp administration and the French government over France's attempt to introduce a MAAMA tax was already outlined in 2019 (Thompson, 2018). Tramp then threatened to impose retaliatory tariffs of 100% on certain "sensitive" goods from France. In the end, the French imposed a 3% tax on companies with global revenues of more than € 750 million a year and with revenues in France of more than € 25 million a year. Already in 2020, however, this tax has been replaced by a new tax on digital giants in all G7 countries. However, this fact has not gone unanswered, causing these countries to significantly cool relations with the US and retaliate with trade (Thompson, 2018). Not surprisingly, some European countries did not follow in the footsteps of the G7 and refrained from joining the tax at all (Poland, for example – it was not only about strictly trade relations, but also Euro-Atlantic-NATO relations) (Galloway, 2024; Le Maire, 2019).

The second dilemma is described by Andreas Vou in the article Big Tech's aggressive EU lobbying has caused a power shift when he notes that the danger of the methods and possibilities of unregulated contact tracking at various levels of privacy stems not only from scale, but also from the monopolistic position of the big four. It is now Google and Apple that dictate to governments the levels of privacy that each country's applications must meet, not the other way around. Responsibility for this situation is not evenly distributed. Countries that host the big four on their

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

territory (e.g., Ireland, Luxembourg, Italy, or Poland) become directly responsible for overseeing the technology sector. It is worth noting at this point that the 2018 report showed for example that data centres have contributed € 7.13 billion to the Irish economy since 2010. "Host in Ireland" predicts that investment in data centres will yield €1.13 billion in 2020 in Ireland, with 12 facilities under construction and 26 more planned, and expects € 6.7 billion in investment between now and 2025, adding to the € 6.2 billion invested so far. Overall, it can be summarized that across the 27 EU countries, data protection agencies have increased staff by 42% and budgets by 49% between 2016 and 2019, but this is still a drop in the ocean of needs (Vou, 2020). However, it is an open secret that the aforementioned MAAMA investment--receiving countries, which, as a consequence, formally become responsible for legal oversight of MAAMA investments, do not control them, due to their excessive role in the development of national economies.

Andreas Vou notes (Vou, 2020) that the Big Four were "saved" from a major conflict with European countries over data protection by the pandemic crisis 2019 when there were encouragements from various decision-making centres (supported mainly by Digital Europe) to increase public funding for the digitization of various sectors of EU economic and social life. This is important because Europe is seen as the most strict guardian of Big-Tech (data protection regulations of May 2018). This can be clearly seen on the scale of GAFA (MAAMA) 's jumping expenses for EU lobbying (up from € 2.8 million in 2013 to € 15.25 million in 2018).

MAAMA store and process vast amounts of information on consumer behaviour and personal data, companies and manufacturers, giving them a strategic advantage not only over users, but also over manufacturers. The scope of data collection is very large. This includes both personal data (such as name and surname, phone number, date of birth, credit card) and usage data (apps and websites visited, location). According to a study by Vanderbilt University, a passive Android phone with Google Chrome browser in the background transmits its location information to Google 340 times a day, accounting for 35% of the data transmitted.

In reference to dilemma three, there are a number of studies raising in their results the concerns of respondents occurring in this area. As an example of such research, polling firm Data for Progress surveyed a sample of 1,200 people in 2020, where as many as about 65% of those declaring their participation in the U.S. general election believe that the economic power of tech companies like Amazon, Google and Facebook is a problem for the U.S. economy (Galloway, 2024; Nylen, 2020).

THE FUTURE OF MAAMA IN THE ERA OF ARTIFICIAL INTELLIGENCE DOMINANCE

The future of digital giants MAAMA in a world dominated by artificial intelligence is unclear. A number of factors that cannot be clearly predicted will influence these corporations in the future. As a result, we can construct two main scenarios for the future of AI-dominated digital corporations – pessimistic and optimistic. These scenarios will mainly differ in terms of changes in the labour market. The authors leave intermediate, complementary variations for future research (Alsaadi & Sallim, 2024).

In general terms, the optimistic scenario assumes that artificial intelligence will be used to complement human intelligence. The pessimistic scenario, on the other hand, assumes that human labour will be replaced by artificial intelligence, which will take over tasks previously performed by humans, leaving them exclusively to robots.

The areas that will be most affected by automation in the near future are: the automotive industry, customer service (Balakrishnan & Dwivedi, 2021), as well as sensitive areas such as healthcare and patient care (Javaid et al., 2021). In addition, manufacturing and transport are segments of the economy that are vulnerable to AI takeover (Abduljabbar et al., 2019). The dynamic entry of AI will, on the one hand, cause a decline in demand for certain professions,

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

but also a decline in interest in certain products if they are mastered by artificial intelligence, where traditionally – the added value – was precisely the contribution of human labour. Examples of this include nursing, hospice work, changes in the art and craft markets, and changes in the very concept of art.

To avoid a pessimistic scenario, it is necessary for AI to be supervised and managed by human minds and to consistently pursue the goals set by humans. Clear, transparent regulations are needed. Moral issues must be given priority. Initiatives aimed at retraining and upskilling people require new structures and responsibilities. While some professions will disappear, others will emerge, offering new employment opportunities and future career prospects. These will be professions based on skills such as programming, statistical evaluation, perception, interpretation, management, empathy and social skills. According to many analysts, continuing technological trends will provide new employment opportunities in positions such as predictive behaviour analyst, rule translator, cyberpsychologist and digital apiary expert, memory optimisation specialist, robotic mechanic, and digital data recovery specialist (Alsaadi & Sallim, 2024).

Achieving a positive scenario will involve cooperation between the human sector (in the labour market) and artificial intelligence. People will focus on aspects that require exceptional skills, strong emotional intelligence, deep industry knowledge, a high level of creativity, critical thinking, and problem-solving skills, while repetitive tasks will be taken over by artificial intelligence.

LAST DAYS RESOLVES. DICUSSION AND CONCLUSION – APPLICATION VALUE

In recent years (December 9, 2023), a preliminary agreement was signed between the European Parliament, the European Commission and the European Council on the AI Act (Andretta, 2020), the first legal regulation on AI.

Meanwhile, literally in the last days, on March 12, 2024, the European Parliament approved it. It implements the aforementioned AI regulation, which the EP adopted on December 9, 2023. The approval came after prior consultations with member states. The approval followed prior consultations with Member States (Walker-Osborn et al., 2024; Yakimova, 2024). Regulations in place prohibit certain applications of generative artificial intelligence. One of the most important exclusions is biometric categorization systems, which use downloaded images of people from the Internet or TV footage in an untargeted manner, enabling the creation of facial recognition tools. The second very important exclusion of AI applications will also be a ban on its use to identify employees' emotions in the workplace and at school. The third exclusion will be the ban on using AI to predict crime based on a personal profile or manipulating people and exploiting their weaknesses (Long et al., 2024; Walker-Osborn et al., 2024). In addition, significant restrictions on the use of AI will be placed on socioeconomic issues such as employment issues, employee management, and issues of law interpretation and application. General-purpose AI systems will have to take into account the principles of copyright law. Asylum policy, border control, and migration management will come under special scrutiny (Hammer & Maher, 2024; Nahara et al., 2024).

Significant restrictions on the use of AI have been introduced to support high-risk systems (Hammer & Maher, 2024) used in critical infrastructure, education and health care (event registers, mandatory human control, additional risk assessment and mitigation systems have been introduced). Specific restrictions and transparency conditions have been introduced in the new EU regulation in the areas of cognitive-behavioral manipulation of people or certain vulnerable groups: this includes, for example, voice-activated toys that encourage children to engage in dangerous behavior (EU AI Act, 2024; Walker-Osborn et al., 2024). The AI Act will include an obligation to assess the impact of high-risk systems on fundamental rights and human security. The AI Act introduces the right to complain about decisions made involving AI. All high-risk AI systems will be subject

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

to permanent evaluation before they are put on the market, and throughout their life cycle (Nahara et al., 2024; Walker-Osborn et al., 2024).

The prohibitions on prohibited practices set forth in the Artificial Intelligence Law will take effect in November. The AI Act's General Provisions (General Purpose) will take effect one year after entry into force, in May 2025, and obligations for high-risk systems in three years (Kroet, 2024; Nahara et al., 2024). Exceptions to this rule will be special cases, related to the activities of the secret services. These are – so far – the first, not only in the EU, but also in the world, regulations normalizing the rules for the use of AI (Hammer & Maher, 2024).

The study demonstrated that the development of artificial intelligence and the progression of machine learning on the very large, increasingly large data sets made available by MAAMA is happening faster than public awareness of it. Societies are unaware of the scale of the risks in unregulated access to sensitive data, but also of the changes coming in the labor market in the near future. The paradox of this situation is that, on the one hand, it is *Generation Z* that is currently the biggest beneficiary of the conveniences and improvements in the comfort of life resulting from the implementation of AI, while on the other hand, it is also they (*Generation Z*) who will bear the biggest costs of the transformations associated with the full entry of AI into our lives in just a few dozen years.

Thus, the research assumptions made in the scientific hypothesis of this work have been confirmed, partially developed, and partially verified, revealing new areas of necessary research in the near future.

The conclusions achieved in the research clearly indicate the need for regulation at both the regional and global levels regarding the activities and use of big data resources by MAAMA companies. The work deals with extremely topical issues. It is legitimate here to state that in the area in question, literally before our eyes, history is being made. The adoption by the European Union just a few months ago of the first legal regulation (UE AI Act, 2024) on the use of artificial intelligence, which is mentioned in the last chapter of the work, is a good proof of this. This article can be used as support during research conducted by a wide range of institutions and organizations (understood as researchers dealing with e-business, as well as research centers, universities and industry organizations). From the point of view of researchers interested in issues in the field of e-business and digital technologies, this article can provide knowledge about the activities carried out by the entities from the MAAMA group, the business strategies they present, as well as the technological innovations presented by them. These companies are able to revolutionize (and in a way already are) revolutionizing various spheres of the digital world. The fate of these companies, their successes and failures can be a valuable source of knowledge. The analysis of the activities carried out by the companies from the MAAMA group can help to understand current trends and future challenges related to e-business in the 21st century. From the point of view of employees of universities and research centers this article could be a valuable source while conducting research on the impact of innovations on social and economic life. It is also hard not to notice the coming changes in the education process itself.

For example: The use of AI to an ever-increasing extent will soon force far-reaching changes in the processing and approval of written works, not only in primary and secondary education, but also in higher education (including master's and even doctoral theses), in terms of the presence of AI-constructed passages in them.

Author contributions: The authors have approved the final version of the article. The authors have contributed to this work as follows: J.K. and Ł.K. developed the concept and designed the study, J.K. and Ł.K. collected the data, J.K. and Ł.K. analyzed and interpreted the data, J.K. and Ł.K. drafted the article, J.K. and Ł.K. revised the article critically for important intellectual content.

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

REFERENCES

Abduljabbar, R., Dia, H., Liyanage, S., & Bagloee, S. A. (2019). Applications of artificial intelligence in transport: An overview. *Sustainability*, *11*(1), Article 189. https://doi.org/10.3390/su11010189

Alaux, S. (Ed.). (2019). *The GAFA problem: Between rising finance, monopoly and freedom of thought*. Net-Wash. https://www.net-wash.fr/en/the-gafa-problem-between-rising-finance-monopoly-and-freedom-of-thought/

Allal-Cherif, O. (2020). *Comment Les GAFA Ont Renforcé Leur Domination* [*How GAFA Have Reinforced Their Domination*]. Forbes. https://www.forbes.fr/business/comment-les-gafa-ont-renforce-leur-domination/

Alsaadi, I., & Sallim, S. (2024). Implications of artificial intelligence dominance on jobs market in the future: A review. *International Journal Papier Advance and Scientific Review*, *5*(3), 1–14. https://doi.org/10.47667/ijpasr.v5i3.312

Anders, C. (2024, January 17). *France joins list of countries where birth rates are declining*. Semafor. https://www.semafor.com/article/01/17/2024/france-joins-list-of-countries-where-birth-rates-are-declining

Andre, V. (2016). *The uncertain digital revolution*. ISTE; Wiley.

Andretta, G. (2020). *The new global order: How GAFA are undermining our democracy*. The New Global Order. https://thenewglobalorder.com/world-news/how-gafa-are-undermining-our-democracy/

Arundell, L., Sudholz, B., Teychenne, M., Salmon, J., Hayward, B., Healy, G., & Timperio, A. (2018). The impact of activity based working (ABW) on workplace activity, eating behaviours, productivity, and satisfaction. *International Journal of Environmental Research and Public Health*, *15*(5), Article 1005. https://doi.org/10.3390/ijerph15051005

Balakrishnan, J., & Dwivedi, Y. K. (2021). Conversational commerce: Entering the next stage of AI-powered digital assistants. *Annals of Operations Research*, *327*, 1–22. https://doi.org/10.1007/s10479-021-04049-5

Baraniewicz, S. (2017). Fenomen wiodącej pozycji Google w branży wyszukiwania w ujęciu historycznym. Pośrednie czynniki sukcesu [The phenomenon of Google's leading position in the search industry historically. Indirect success factors]. *Zarządzanie Mediami* [*Media Management*], *2*, 79–88.

Barsukova, N. (2025). The role of the national spatial data system in land resources management, regulation of land and property relations. *Moscow Economic Journal*, *10*(1). https://doi.org/10.55186/24130466X_2025_10_1_5

Berrington, A., Kuang, B., & Perelli-Harris, B. (2024). *Intending to remain childless: Are concerns about climate change and overpopulation the cause?* Centre for Population Change. https://www.cpc.ac.uk/docs/PB72_Intending_to__remain_childless_are_concerns_about_climate_change_and_overpopulation_the_cause.pdf

Brin, S., & Page, L. (1997). *The anatomy of a large-scale hypertextual Web search engine*. Stanford University. http://infolab.stanford.edu/pub/papers/google.pdf

Brügger, N. (2015). A brief history as a media text: The development of an empty structure. *First Monday*. https://doi.org/10.5210/fm.v20i11.5423

Burtan, G. (2019). *Drżą przed nią giganci Doliny Krzemowej* [*Silicon Valley giants tremble before it*]. Cyfrowa RP. https://cyfrowa.rp.pl/biznes/38068-drza-przed-nia-giganci-doliny-krzemowej

Castells, M. (2003). *The Internet galaxy: Reflections on the Internet, business, and society*. Oxford University Press.

Castells, M. (2009). *The rise of the network society: The information age: Economy, society, and culture* (2nd ed.). Blackwell Publishers.

Chopra, N. (2023). *Accelerated digital transformation: How established organizations can gain competitive advantage in the digital age*. Kogan Page.

Cieślińska, B. (2014). Bezdzietność jako styl życia. Bezdzietność a gospodarstwa domowe [Childlessness as a lifestyle. Childlessness and households]. In: *Pogranicze. Studia Społeczne* [*Borderland. Social Studies*] (Vol. 24). Wydawnictwo Uniwersytetu w Białymstoku.

Czajkowski, P. (2022). *„Brukowanie cyfrowej drogi do piekła?" Systemy cyfrowej identyfikacji służą inwigilacji i kontroli* [*"Paving the digital road to hell?" Digital identification systems are used for surveillance and control*]. ITHardware. https://ithardware.pl/aktualnosci/brukowanie_cyfrowej_drogi_do_piekla_systemy_cyfrowej_indentyfikacji_sluza_inwigilacji_i_kontroli-22379.html

Czubkowska, S. (2018). *Bracia Winklevoss. Za odszkodowania od Facebooka wybudowali bitcoinowe imperium* [*Winklevoss brothers. They built a bitcoin empire with compensation from Facebook*]. Wyborcza. https://wyborcza.pl/7,156282,23014322,bracia-winklevoss-za-odszkodowanie-od-facebooka-zbudowali-bitcoinowe.html

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

Doytsher, Y., Kelly, P., Khouri, R., McLaren, R., & Potsiou, C. (2010). *Rapid urbanization and mega cities: The need for spatial information management*. FIG Commission.

Dyka, M. (2020). *Google stworzył cennik dla służb w USA dotyczący opłat za dostęp do danych użytkowników* [*Google has created a price list for services in the U.S. to charge for access to user data*]. Legalnie w Sieci. https://www.legalniewsieci.pl/aktualnosci/ile-sobie-liczy-google-za-udostepnienie-danych

European Parliament. (2024). *EU AI Act*. https://artificialintelligenceact.eu/ai-act-explorer/

Eurostat. (2023). *Fertility statistics*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Fertility_statistics

Flew, T., Holt, J., & Julian, T. (Eds.). (2023). *The SAGE handbook of the digital media economy*. SAGE Publishing.

Four Week MBA. (2024). *Advertising business models*. https://fourweekmba.com/advertising-business-models/

Fuchs, R. J., Brennan, E., Lo, F.-C., Uitto, J. I., & Chamie, J. (1994). *Mega-city growth and the future*. United Nations University Press.

Galloway, S. (2024). *Wielka czwórka. Ukryte DNA: Amazon, Apple, Facebook i Google* [*The Four. The hidden DNA of Amazon, Apple, Facebook, and Google*]. Rebis.

Gleiss, A., Kohlhagen, M., & Pousttchi, K. (2021). An Apple a day – how the platform economy impacts value creation in the healthcare market. *Electronic Markets*, *31*(2), 202–225. https://doi.org/10.1007/s12525-020-00445-3

Golenia, M., Gurdak, R., Jarocińska, A., Mierczyk, M., Ochtyra, A., & Zagajewski, B. (2016). Zastosowanie zobrazowań satelitarnych Landsat do detekcji zmian obszarów zurbanizowanych [The use of Landsat satellite imagery for detecting changes in urbanized areas]. In: *Forum użytkowników licencji edukacyjnej SITE oprogramowania ArcGIS na Uniwersytecie Warszawskim* (Vol. 2/3, pp. 91–101).

Guilherme, G. C. (2019). *Global technology and legal theory: Transnational constitutionalism, Google and the European Union*. Routledge.

Hammer, B., & Maher, C. (2024). *EU Parliament approves EU AI Act*. ByteBack Law. https://www.bytebacklaw.com/2024/03/eu-parliament-approves-eu-ai-act/

Jarocińska, A. (2014). Radiative transfer model parametrization for simulating the reflectance of meadow vegetation. *Miscellanea Geographica – Regional Studies on Development*, *18*(2), 5–9. https://doi.org/10.2478/mgrsd-2014-0001

Jarocińska, A., Białczak, M., & Sławik, Ł. (2018). Application of aerial hyperspectral images in monitoring tree biophysical parameters in urban areas. *Miscellanea Geographica – Regional Studies on Development*, *22*(1), 56–62. https://doi.org/10.1515/mgrsd-2017-0034

Javaid, M., Haleem, A., Singh, R. P., & Suman, R. (2021). Substantial capabilities of robotics in enhancing industry 4.0 implementation. *Cognitive Robotics*, *1*, 58–75. https://doi.org/10.1016/j.cogr.2021.06.001

Jin, G., Leccese, M., & Wagman, L. (2022). *How do top acquirers compare in technology mergers? New evidence from an S&P taxonomy* (NBER Working Paper No. 29642). National Bureau of Economic Research. https://doi.org/10.3386/w29642

Kasprzak, W. (2018). Ciemna strona Facebooka. Analiza kryminalistyczna [The dark side of Facebook. A forensic analysis]. *Studia Prawnoustrojowe* [*Legal Studies*], (40), 201–212.

Kelleher, J. D. (2019). *Deep learning*. MIT Press.

Kilar, W. (2009). Rola korporacji Apple w kształtowaniu społeczeństwa informacyjnego [Apple corporation's role in shaping the information society]. *Przedsiębiorczość – Edukacja* [*Entrepreneurship – Education*], *5*, 48–56.

Kowalska, J. (2017). *Historia potęgi, czyli jak Facebook podbił świat* [*A history of power, or how Facebook conquered the world*]. Marketing i Biznes. https://marketingibiznes.pl/social-media/historia-potegi-czyli-jak-facebook-podbil-swiat/

Kroet, C. (2024). *As AI Act enters into force, focus shifts to countries' oversight appointments*. Euronews. https://www.euronews.com/next/2024/03/12/as-ai-act-enters-into-force-focus-shifts-to-countries-oversight-appointments

Krówczyńska, M., Raczko, E., Staniszewska, N., & Wilk, E. (2020). Asbestos-cement roofing identification using remote sensing and convolutional neural networks (CNNs). *Remote Sensing*, *12*(3), Article 408. https://doi.org/10.3390/rs12030408

Krówczyńska, M., & Wilk, E. (2023). Hazardous waste in the Anthropocene: The comparative methods for asbestos roofs detection to assess the environmental risk. *The Anthropocene Review*, *11*(2), 434–453. https://doi.org/10.1177/20530196231207981

Kryśkiewicz, Ł. (2017). *Wpływ firmy Amazon na rozwój nowych technologii* [*Amazon's influence on*

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

the development of new technologies]. Dziennik Internautów. http://di.com.pl/wplyw-firmy-amazon-na-rozwoj-nowych-technologii-58534

Kurzak, T. (2015). *Historia Facebooka, czyli o tym jak Zuckerberg buduje Internet w Internecie* [*The story of Facebook, or how Zuckerberg is building the Internet on the Internet*]. Softonet. https://softonet.pl/publikacje/rzuty_okiem/Historia.Facebooka.czyli.o.tym.jak.Zuckerberg.buduje.internet.w.internecie,1241

Le Maire, B. (2019). *France unveils plans for its GAFA tax, a new taxation on digital companies*. Euronews. https://www.euronews.com/2019/03/06/france-unveils-plans-for-its-gafa-tax-a-new-taxation-on-digital-companies

Lindsay, H. (2017). *Digital transformation: Build your organization's future for the innovation age*. Bloomsbury.

Long, W. R. M., Cuyvers, L., Bruynseraede, M., & Subbulakshmi, K. (2024). *EU formally adopts world's first AI law.* Sidley Austin LLP. https://datamatters.sidley.com/2024/03/21/eu-formally-adopts-worlds-first-ai-law/

Ma, J. (2022). *Regulating data monopolies: A law and economics perspective*. Springer.

Mahajan, A. G., & Narkede, P. G. (2024). Integrating BIM with digital technology trends in the construction industry: Implementation insights for 2023. *Library Progress (International)*, *44*(3), 20283–20308.

Mallach, A. (2024). *France joins list of countries where birth rates are declining*. Semafor. https://www.semafor.com/article/01/17/2024/france-joins-list-of-countries-where-birth-rates-are-declining

Marielle, C. (2021). *GAFA, BATX and operators on the hunt for data and AI*. Sofrecom. https://www.sofrecom.com/en/news-insights/gafa-batx-and-operators-on-the-hunt-for-data-and-ai.html

Mazur, A., & Papirnyk, S. (2022). Innovation as a factor of competitiveness and company's market dominance. *Economic Analysis*, *32*(2).

Miall, C. E. (1986). The stigma of involuntary childlessness. *Social Problems*, *33*(4), 268–282. https://doi.org/10.1525/sp.1986.33.4.03a00020

Migas-Mazur, R., Kycko, M., Zwijacz-Kozica, T., & Zagajewski, B. (2021). Zastosowanie zdjęć satelitarnych Sentinel-2 do obserwacji gradacji kornika drukarza w Tatrzańskim Parku Narodowym [The use of Sentinel-2 satellite images to observe bark beetle infestation in the Tatra National Park]. In: *Przyroda Tatrzańskiego Parku a Człowiek. Zmiany w Tatrach – zagrożenia istniejące a potencjalne* (pp. 215–228). Wydawnictwo Naukowe UP. https://doi.org/10.24917/9788380847057.10

Mishra, R., Nath, N. K., Das, P., & Gautam, V. K. (2023). Technology and tools for land use management. In: *Advances in land and water resources management concept and application* (pp. 4–6). Image Print Media.

Młynarska-Sobaczewska, A., & Zaleśny, J. (2022). GAFAM – globalne korporacje cyfrowe jako uczestnicy procesów politycznych [GAFAM – global digital corporations as participants in political processes]. *Przegląd Prawa Konstytucyjnego* [*Constitutional Law Review*], *3*(67).

Nahara, K. J., Evers, A., Jessani, A. A., Braun, M., Vallery, A., & Beniziri, I. (2024). *The European Parliament adopts the AI Act*. WilmerHale. https://www.wilmerhale.com/en/insights/blogs/wilmerhale-privacy-and-cybersecurity-law/20240314-the-european-parliament-adopts-the-ai-act

Nylen, L. P. (2020). *Majority of Americans concerned about Big Tech's economic, political power.* Politico. https://www.politico.com/news/2020/09/17/big-tech-economic-political-power-poll-417024

Oleszczuk, T. (2021). *20 proc. par mierzy się z niepłodnością. W większości nie z winy kobiety* [*20% of couples face infertility. Mostly not the woman's fault*]. Poradnik Zdrowie. https://www.poradnikzdrowie.pl/zdrowie/choroby-kobiece/20-proc-par-mierzy-sie-z-nieplodnoscia-w-wiekszosci-nie-z-winy-kobiety-aa-Za6L-nbbL-YRrv.html

Orlowski, T. L. (2008). *Stages of the 2007/2008 global financial crisis: Is there a wandering asset-price bubble?* (Economics Discussion Paper No. 2008-43). Sacred Heart University.

Przybył, I. (2003). Naznaczanie społeczne i samonaznaczanie osób niepłodnych [Social labeling and self-labeling of infertile people]. *Roczniki Socjologii Rodziny* [*Annals of Family Sociology*], *15*, 47–61.

Radosavljevic, Z. (Ed.). (2020). *Commission eyes US GAFA hearing for future competition challenges*. Euractiv. https://www.euractiv.com/section/digital/news/commission-eyes-us-gafa-hearing-for-future-competition-challenges/

Rzeźnik, G., Piwowar, K., Jakubiak, Z., & Czarnicka, J. (2023). *Przegląd wybranych inicjatyw i technologii z rekomendacjami dla przedsiębiorców* [*Overview of selected initiatives and technologies with recommendations for entrepreneurs*] (Raport nr 3). Szkoła Wyższa Psychologii Społecznej. https://www.parp.gov.pl/storage/publications/pdf/Raport-

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl

tematyczny_zastosowania_sztucznej_inteligencji_w_gospodarce_20230616.pdf

Sandua, D. (2023). *Technological giants: Google, Apple, Facebook, Amazon and the digital revolution*.

Shin-yi, P., Ching-Fu, L., & Streinz, T. (Eds.). (2021). *Artificial intelligence and international economic law: Disruption, regulation, and reconfiguration*. Cambridge University Press. https://doi.org/10.1017/9781108954006

Soltanifer, M., Hughes, M., & Göcke, L. (Eds.). (2021). *Digital entrepreneurship: Impact on business and society*. Springer. https://doi.org/10.1007/978-3-030-53914-6

Statcounter. (2025). *Search engine market share worldwide – August 2025*. https://gs.statcounter.com/search-engine-market-share

Stefaniak, G. (2018). Possibility of using regional geoportals in agricultural development on the example of the Łódzkie Voivodeship Geoportal. *Studia Obszarów Wiejskich* [*Rural Studies*], *52*, 111–126. https://doi.org/10.7163/SOW.52.8

Sujon, Z. (2021). *The social media age*. SAGE Publishing.

Szymańska, D., & Wylon, M. (2019). Demographic changes in Polish cities in the years 1950–2016. *Bulletin of Geography. Socio-economic Series*, *44*, 103–114. https://doi.org/10.2478/bog-2019-0018

Śledziewska, K., & Włoch, R. (2021). *The economics of digital transformation: The disruption of markets, production, consumption, and work*. Routledge. https://doi.org/10.4324/9781003144366

Tadeusiewicz, R. (2020). Czy to GAFA rządzi współczesnym światem? [Is it GAFA that rules the modern world?]. *Gazeta Krakowska*, *16*, 12–13.

Thompson, N. (2018). *Emmanuel Macron talks to WIRED about France's AI strategy*. Wired. https://www.wired.com/story/emmanuel-macron-talks-to-wired-about-frances-ai-strategy/

Usidus, M. (2019). *Polski proces przeciw Facebookowi w globalnym kontekście – analizuje Mirosław Usidus* [*The lawsuit against Facebook in a global context, analyzes Miroslaw Usidus*]. Stowarzyszenie Dziennikarzy Polskich. https://sdp.pl/polski-proces-przeciw-facebookowi-w-globalnym-kontekscie-analizuje-miroslaw-usidus/

Vou, A. (2020). *Big Tech's aggressive EU lobbying has caused a power shift*. Voxeurop. https://voxeurop.eu/en/big-techs-aggressive-eu-lobbying-has-caused-a-power-shift/

Walker-Osborn, C., Storm, M., Moerel, L., Ehle, K., & Stuecle, C. (2024). *EU AI Act – Landmark law on artificial intelligence approved by the European Parliament*. Morrison Foerster. https://www.mofo.com/resources/insights/240314-eu-ai-act-landmark-law-on-artificial-intelligence

Wixforth, S. (2019). *Gdy zwycięzca bierze wszystko, wszyscy tracą* [*When the winner takes all, everyone loses*]. Krytyka Polityczna. https://krytykapolityczna.pl/gospodarka/uregulowac-amazona-wixforth/

Yakimova, Y. (2024). *Artificial Intelligence Act: MEPs adopt landmark law*. European Parliament. https://www.europarl.europa.eu/news/en/press-room/20240308IPR19015/artificial-intelligence-act-meps-adopt-landmark-law

Yazizioglu, A. E. (2024). *Social media and tax law*. Routledge.

Yuhashi, H., & Morita, J. (2021). A trial market launch of affective search service with a local area ICT business. *Japan Marketing Journal*, *41*(2). https://doi.org/10.7222/marketing.2021.047

Zagajewski, B., Kycko, M., Tømmervik, H., Bochenek, Z., Wojtuń, B., Bjerke, J. W., & Kłos, A. (2018). Feasibility of hyperspectral vegetation indices for the detection of chlorophyll concentration in three High Arctic plants: Salix polaris, Bistorta vivipara, and Dryas octopetala. *Acta Societatis Botanicorum Poloniae*, *87*(4), Article 3604. https://doi.org/10.5586/asbp.3604

✉jacek_kwiatkowski@sggw.edu.pl, ✉lkrysk@sgh.waw.pl